6.7 Modeling with Trig

I can...
Apply angles of elevation and depression with trigonometric ratios to find missing measurements.

Angle of Elevation:

A flying trapeze artist is 50 ft in the air. If the ring master is 150 ft away from the trapeze artist, what is the angle of elevation between them?

\[
\sin \theta = \frac{50}{150}
\]

\[
\theta = \arcsin \frac{50}{150}
\]

\[
\theta = 19.471^\circ
\]

Angle of Depression:

A search and rescue team is airlifting people from the scene of a boating accident when they observe another person is in need to help. If the angle of depression from the helicopter to this other person is 42˚ and the helicopter is 18 feet above the boat in the water, what is the distance from the boat to this person?

\[
\tan 42^\circ = \frac{18}{x}
\]

\[
x \cdot \tan 42^\circ = 18
\]

\[
x = \frac{18}{\tan 42^\circ}
\]

\[
x = 19.991 \text{ ft}
\]

A fan is seated in the upper deck of a stadium 200 feet away from home plate. If the angle of depression to the field is 62˚, at what height is the fan sitting?

\[
\sin 62^\circ = \frac{x}{200}
\]

\[
200 \sin 62^\circ = x
\]

\[
x = 176.590 \text{ ft}
\]
A fan is seated in the upper deck of a stadium 280 feet away from home plate. If the angle of depression to the field is $60^\circ$, what is the exact height the fan is sitting at?

\[
\frac{\text{height}}{280} = \tan 60^\circ
\]

\[
\text{height} = \frac{280 \sqrt{3}}{2}
\]

\[
= 140\sqrt{3} \text{ feet}
\]

Leah is meeting friends at the castle in the center of Disneyland. She sights the top of the castle at an angle of elevation of $38^\circ$. Her eye level is 5 ft above the ground. From the park's brochure, she knows that the castle is 189 ft tall. How far is Leah from the castle?

\[
\tan 38^\circ = \frac{184}{x}
\]

\[
x \cdot \tan 38^\circ = 184
\]

\[
x = \frac{184}{\tan 38^\circ}
\]

\[
= 235.509 \text{ feet}
\]

Two light posts are 158 feet apart. From the exact middle, the angles of elevation are $21^\circ$ for the shorter light and $52^\circ$ for the taller light. How much taller is the taller light post than the shorter one? Round to the nearest thousandth.

\[
\tan 52^\circ = \frac{y}{79}
\]

\[
\tan 21^\circ = \frac{y}{79}
\]

\[
79 \tan 52^\circ = x
\]

\[
79 \tan 21^\circ = y
\]

\[
x = 101.11 \text{ feet}
\]

\[
y = 30.325 \text{ feet}
\]

\[
\text{Difference} = 101.11 - 30.325 = 70.785 \text{ feet}
\]